WE CLAIM:

1. An isochronous switched fabric network comprising:

(a) a plurality of interconnected switched nodes forming multiple dimensions, each switched node comprising an upstream port and a downstream port for each dimension, each upstream and downstream port comprising an input port and an output port;

(b) a discovery facility for discovering a depth of each dimension, and for discovering resources within each switched node;

(c) an addressing facility for assigning a matrix address to each switched node;

(d) a resource reservation facility for reserving resources within each switched node to establish a path through the switched fabric network for transmitting an isochronous data stream; and

(e) a scheduling facility for scheduling isochronous data transmitted through the switched fabric network.

2. The isochronous switched fabric network as recited in claim 1, wherein the discovery facility comprises a central processor.

3. The isochronous switched fabric network as recited in claim 2, wherein the central processor is attached to one of the switched nodes.

4. The switched fabric network as recited in claim 3, wherein:

(a) the switched nodes are connected in each dimension to form a loop;

(b) the central processor transmits an initialization packet through the output port of each downstream port to the input port of the corresponding upstream ports of adjacent switched nodes;

(c) each switched node along each dimension modifies the initialization packet and forwards the initialization packet through the corresponding downstream port for the

dimension; and

(d) the central processor evaluates the initialization packets to determine the depth of each dimension and to determine the resources within each switched node.

5. The switched fabric network as recited in claim 4, wherein:

(a) the initialization packet comprises a dimension node number (DNN) comprising a plurality of sub-fields;

(b) each sub-field represents one of the dimensions; and

(c) each switched node along each dimension increments the corresponding sub-field within the DNN in the initialization packet.

6. The isochronous switched fabric network as recited in claim 1, wherein the discovery facility is distributed throughout the switched nodes.

7. The isochronous switched fabric network as recited in claim 6, wherein the discovery facility comprises a plurality of processors attached to the switched nodes.

8. The switched fabric network as recited in claim 6, wherein:

(a) the switched nodes are connected in each dimension to form a loop;

(b) an initialization packet comprising an initialization ID and an initialization dimension node number (DNN) is transmitted between the switched nodes of each dimension; and

(c) each switched node further comprises:

a local ID;

a local DNN representing at least part of the matrix address for the switched node; and

a controller for comparing the initialization ID to the local ID and for modifying the local DNN and the initialization DNN in response to the comparison.

9. The switched fabric network as recited in claim 1, wherein the matrix address comprises a plurality of contiguous sub-fields corresponding to each dimension, each sub-field comprising a number of bits n where:

$$n = \text{round}(0.5 + (\log(\text{dimension\_depth})/\log(2)))$$

where the dimension_depth is the depth of the dimension corresponding to the sub-field.

10. The switched fabric network as recited in claim 1, wherein:

(a) the resource reservation facility is distributed throughout the switched nodes; and

(b) each switched node comprises a leasing facility for leasing idle resources to other switched nodes.

11. A method of transmitting data through an isochronous switched fabric network comprising a plurality of interconnected switched nodes forming multiple dimensions, each switched node comprising an upstream port and a downstream port for each dimension, each upstream and downstream port comprising an input port and an output port, the method comprising the steps of:

(a) discovering a depth of each dimension and discovering resources within each switched node;

(b) assigning a matrix address to each switched node;

(c) reserving resources within each switched node to establish a path through the switched fabric network for transmitting an isochronous data stream; and

(d) scheduling isochronous data transmitted through the switched fabric network.

12. The method of transmitting data through an isochronous switched fabric network as recited in claim 11, wherein a central processor performs the discovery steps.

13. The method of transmitting data through an isochronous switched fabric network as recited in claim 12, wherein the central processor is attached to one of the switched nodes.

14. The method of transmitting data through an isochronous switched fabric network as recited in claim 13, wherein the switched nodes are connected in each dimension to form a loop, the method further comprises the steps of:

(a) the central microprocessor transmitting an initialization packet through the output port of each downstream port to the input port of the corresponding upstream ports of adjacent switched nodes;

(b) modifying the initialization packet at each switched node and forwarding the initialization packet through the corresponding downstream port for the dimension; and

(c) the central microprocessor evaluating the initialization packets to determine the depth of each dimension and to determine the resources within each switched node.

15. The method of transmitting data through an isochronous switched fabric network as recited in claim 14, wherein:

(a) the initialization packet comprises a dimension node number (DNN) comprising a plurality of sub-fields;

(b) each sub-field represents one of the dimensions; and

(c) each switched node along each dimension increments the corresponding sub-field within the DNN in the initialization packet.

16. The method of transmitting data through an isochronous switched fabric network as recited in claim 11, wherein the discovery step is distributed to the switched nodes.

17. The method of transmitting data through an isochronous switched fabric network as recited in claim 16, wherein the switched nodes are connected in each dimension to form a loop, each switched node comprises a local ID and a local DNN representing at least part of the matrix address for the switched node, the method further comprises the steps of:

(a) transmitting an initialization packet comprising an initialization ID and an initialization dimension node number (DNN) between the switched nodes of each dimension; and

(b) comparing the initialization ID to the local ID within each switched node and modifying the local DNN within each switched node and the initialization DNN in response to the comparison.

18. The method of transmitting data through an isochronous switched fabric network as recited in claim 11, wherein the matrix address comprises a plurality of contiguous sub-fields corresponding to each dimension, each sub-field comprising a number of bits n

where:

$$n = \mathrm{round}(0.5 + (\log(\mathrm{dimension\_depth})/\log(2)))$$

where the dimension_depth is the depth of the dimension corresponding to the sub-field.

19. The method of transmitting data through an isochronous switched fabric network as recited in claim 11, further comprising the step of leasing idle resources within a first switched node to a second switched node.